Concept of Use for the Weather Accident Prevention Project Technologies

September 21, 2005

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WxAP Technologies

- Cockpit Weather Technologies
- Airborne Weather Sensor Technologies
- Weather Communication Technologies
- Turbulence Technologies

Overview

- Transport Aircraft WxAP Technologies
  - 14 CFR Parts 121 and 135
  - Class A Airspace; 18,000 – 60,000 feet MSL
  - Aircraft weighing more than 12,500 pounds
- General Aviation WxAP Technologies
  - 14 CFR Part 23
  - Aircraft operating below 18,000 feet MSL

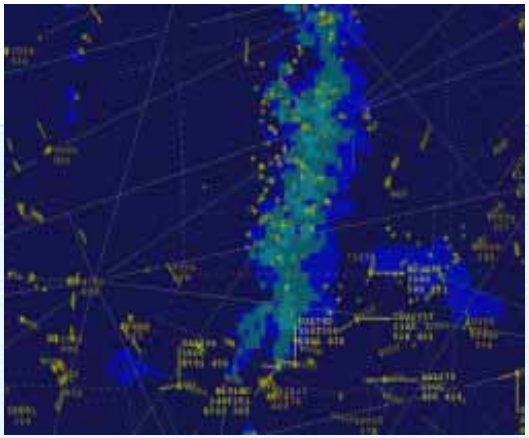
Aircraft Operators

- Students, recreational, private and commercial pilots
- Diverse training and skills and physiological and psychological conditions
- To be effective must be aware and understand weather information and how to apply it to flight situations

Aviation Wx Information in the NAS

- Aural Sources
  - Direct queries to Flight Service Station
  - En Route Flight Advisory Service (EFAS or “Flight Watch”)
  - ATC personnel
  - Monitoring radio frequencies to overhear other pilot comments
  - Automated weather information services
- On-board Color Weather Radars
- Datalinked textual messages
- “Out-the-window” weather cues

Evolving Aviation Weather in the NAS



- Weather and Radar Processor (WARP)
  - Installed at all ARTCCs nationwide in 2002
  - Common Weather Picture
  - Pilot, Flight Service Station Briefer and the Tower Controller have the same picture

Transport Aircraft System

- Two pilots
- Suite of avionics instruments suitable for Instrument Flight Rules (IFR)
- Color Weather Radar and display
- Minimum of two communications systems
- Flight Management System

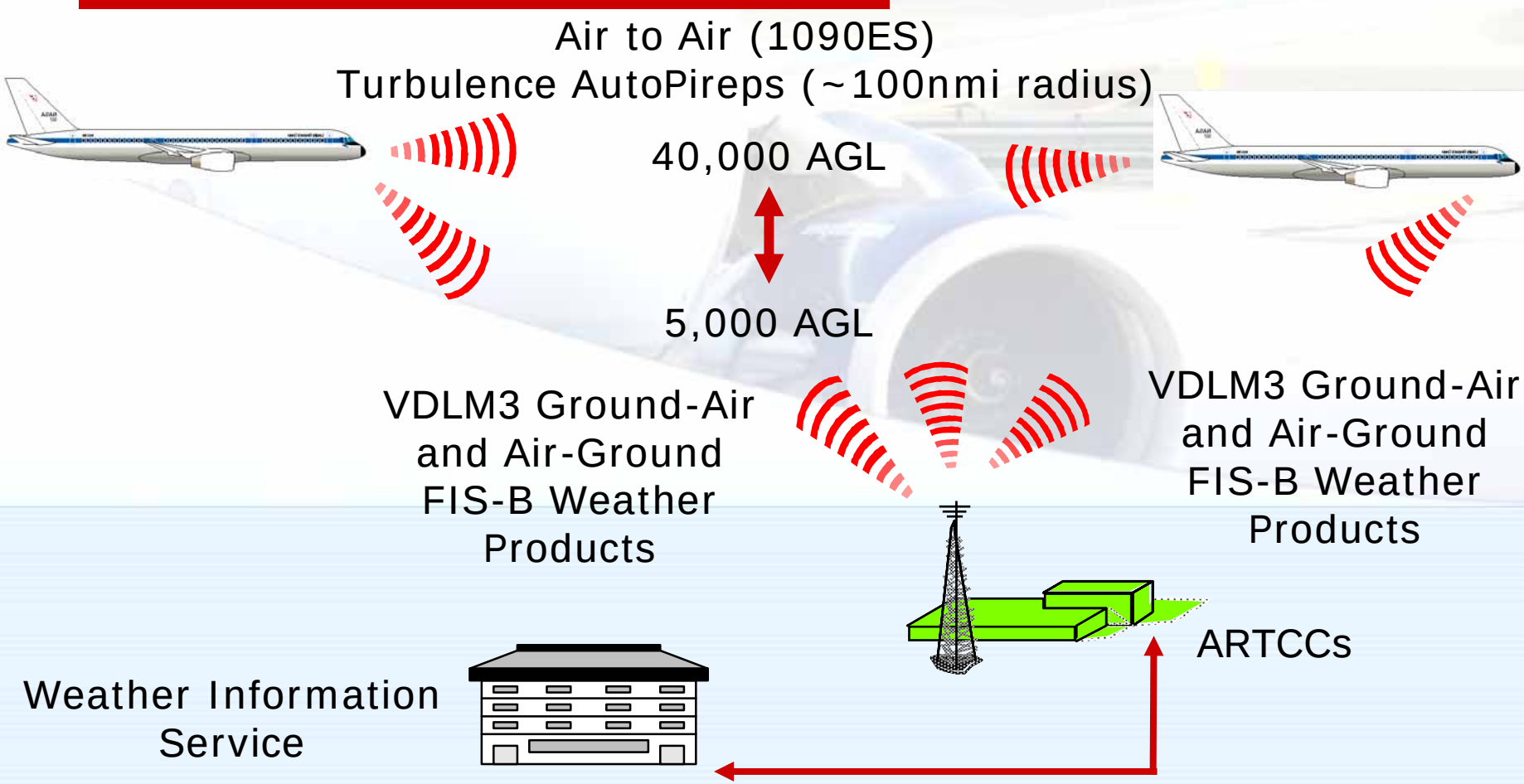
En route Weather Considerations

- Adverse Conditions
  - Forecast conditions along the proposed route, i.e. climb out, en route, descent
  - Significant meteorological and aeronautical information that may influence the pilot to alter the proposed route of flight
  - Thunderstorms, icing, turbulence, mountain obscuration, low ceilings or visibilities, airport closures, and instrument flight conditions
  - Winds and temperature aloft

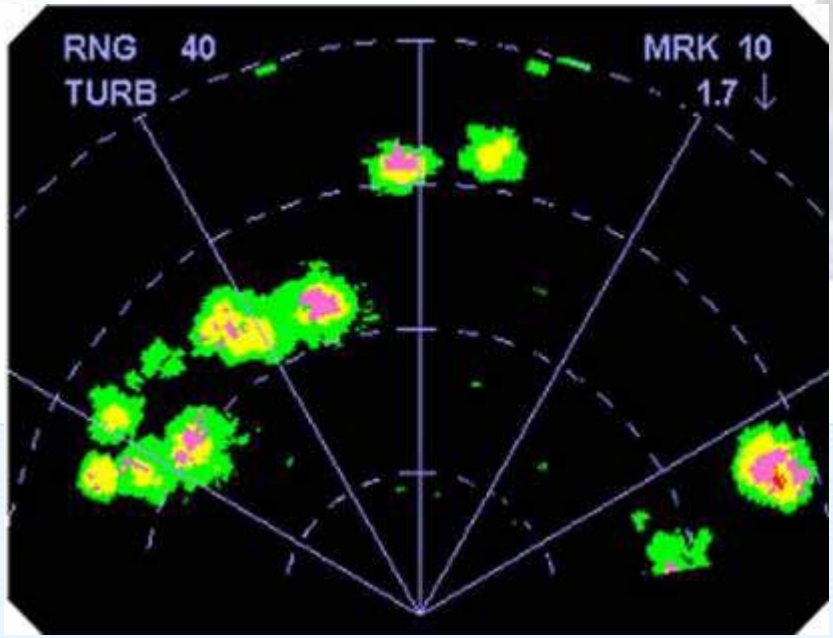
WxAP Transport Aircraft Technologies

- WINCOMM-1090 Extended Squitter (ES) and VHF Data Link Mode 3 (VDLM3) Advanced communications systems
- AWIN-Airborne Hazard Awareness System (AHAS), presentation of graphical weather products and flight-path hazards
- TPAWS-Turbulence AutoPIREP System (TAPS), Light Detection and Ranging (LIDAR), and Enhanced Turbulence Detection Radar (ETDR)

En Route NAS Communications

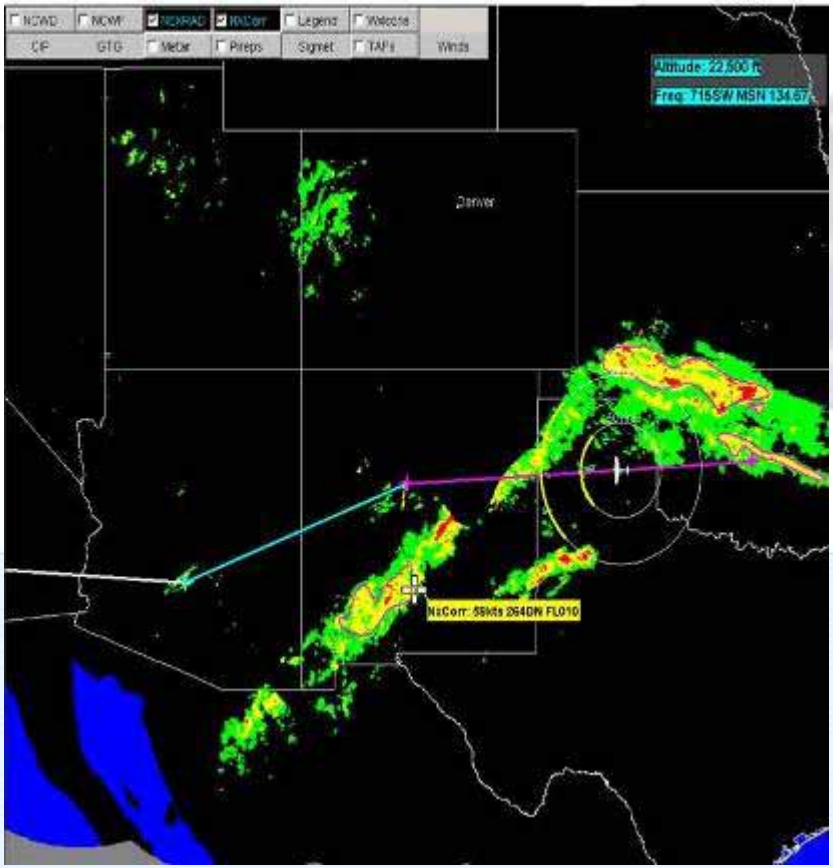


ETDR & Turbulence AutoPIREP Reporting



- Enhanced radar for turbulence hazard detection
- Automated reporting of an aircraft turbulence encounter
- Increase plots' situational awareness of turbulence hazards
- Display turbulence hazard information
- Scaled to own aircraft
- Avoid encounter or prepare crew and passengers for the encounter

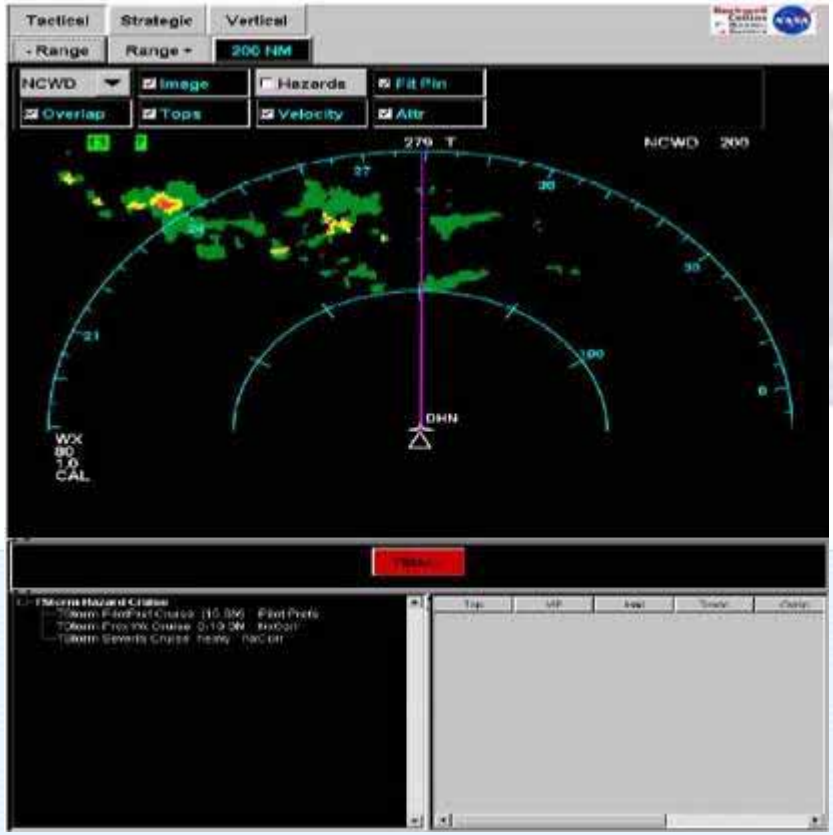
Convective Weather in the NAS



- Transport Operations
  - Monitor weather information for updated convective and turbulence forecast
  - Trend forecast to flight plan
  - Optimize route as required
  - Collaborative decision making

International Communications

Convective Wx international Flight



- Pacific, Atlantic or Caribbean Operations
  - Access to ground based weather and flight service facilities are limited
  - AHAS Tactical Display
  - Turbulence AutoPIREP System
  - Enhanced Turbulence Detection Radar

GA Aircraft

- Airplane of known heritage, homebuilt, vintage fighter aircraft
- Provides personal, business, and freight transportation
- Supports diverse activities
  - Law Enforcement, forestry, fire fighting, air ambulance, logging, fish and wildlife spotting

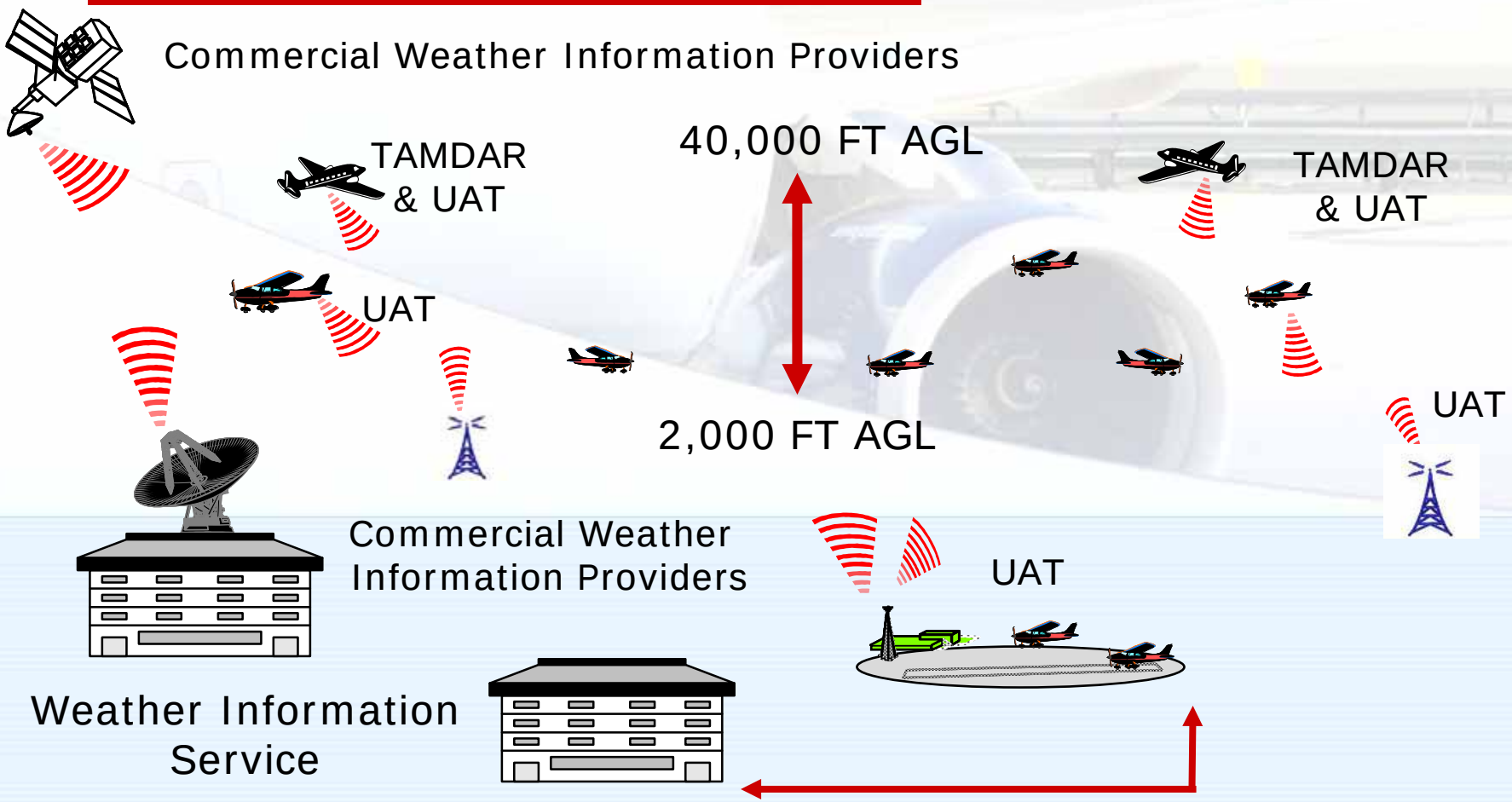
GA Aircraft Weather Systems

- Limited inflight information about convective weather activity
- Most are not equipped with onboard weather detection equipment
- Single pilot normally depends on aural information
- Basic landing strips with minimum flight service equipment

GA Weather Information Technologies

- WINCOMM - Universal Access Transceiver (UAT), advanced communications systems
- AWIN - Aviation Weather Awareness and Reporting Enhancements (AWARE), presentation of graphical weather products and flight-path hazards
- TAMDAR - Onboard weather sensor

GA Aircraft Weather Communications



GA Graphic Wx Information System

- Provide convective weather information for hazardous weather avoidance
- Graphical representation of the text based Wx reports
- Own aircraft position in relation to storm movement
- Display own-ship TAMDAR Sensor Information
  - Icing, relative winds, turbulence, and pressure altitude information
- Display received TAMDAR sensor info from other aircraft

Summary of WxAP Technologies

- Dissemination of FIS-B weather information using ADS-B Links
- Graphical display of own-ship position relative to convective weather hazard
- Collect and disseminate critical weather information utilizing the TAMDAR
- Detect and automatically disseminate turbulence PIREPs scaled to their aircraft
- ETDR for enhanced turbulence detection